2.0 SITE CLOSEOUT PROCESS FOR TYPICAL REMEDY SCENARIOS

Section 1 introduced and defined the major phases and milestones used in the Defense Environmental Restoration Program to describe the environmental site closeout process:

- **Remedial Action Construction (RA-C)**;
- **Remedy in Place (RIP)**;
- **Remedial Action Operation (RA-O)**;
- **Response Complete (RC)**;
- **Long-Term Monitoring (LTM)**; and
- **Site Closeout (SC)**

Sections 3 and 4 discuss in greater detail the specific meanings and requirements of these phases and milestones in CERCLA and RCRA regulatory frameworks, respectively.

This section illustrates the application of the phases and milestones in typical remedy scenarios (independent of regulatory frameworks). Figure 2.0 and Table 2.0 show six general remedy scenarios and the application of the site closeout terminology to each. Most final remedies at sites or OUs will be comprised of one or more of these scenarios; in many cases, a final remedy will be a hybrid of some or all of these scenarios. For example, the remedy at a site with combined soil and groundwater contamination may include excavation of the soil-based source contamination combined with groundwater pump-and-treat to remediate associated groundwater contamination.

Figure 2.0 and Table 2.0 demonstrate that not all phases or milestones are applicable to every remedy scenario. In some cases, a scenario may comprise few phases, with multiple milestones achieved simultaneously; in other cases, a more extensive remedy may undergo all phases and milestones, and may be separated by several years.

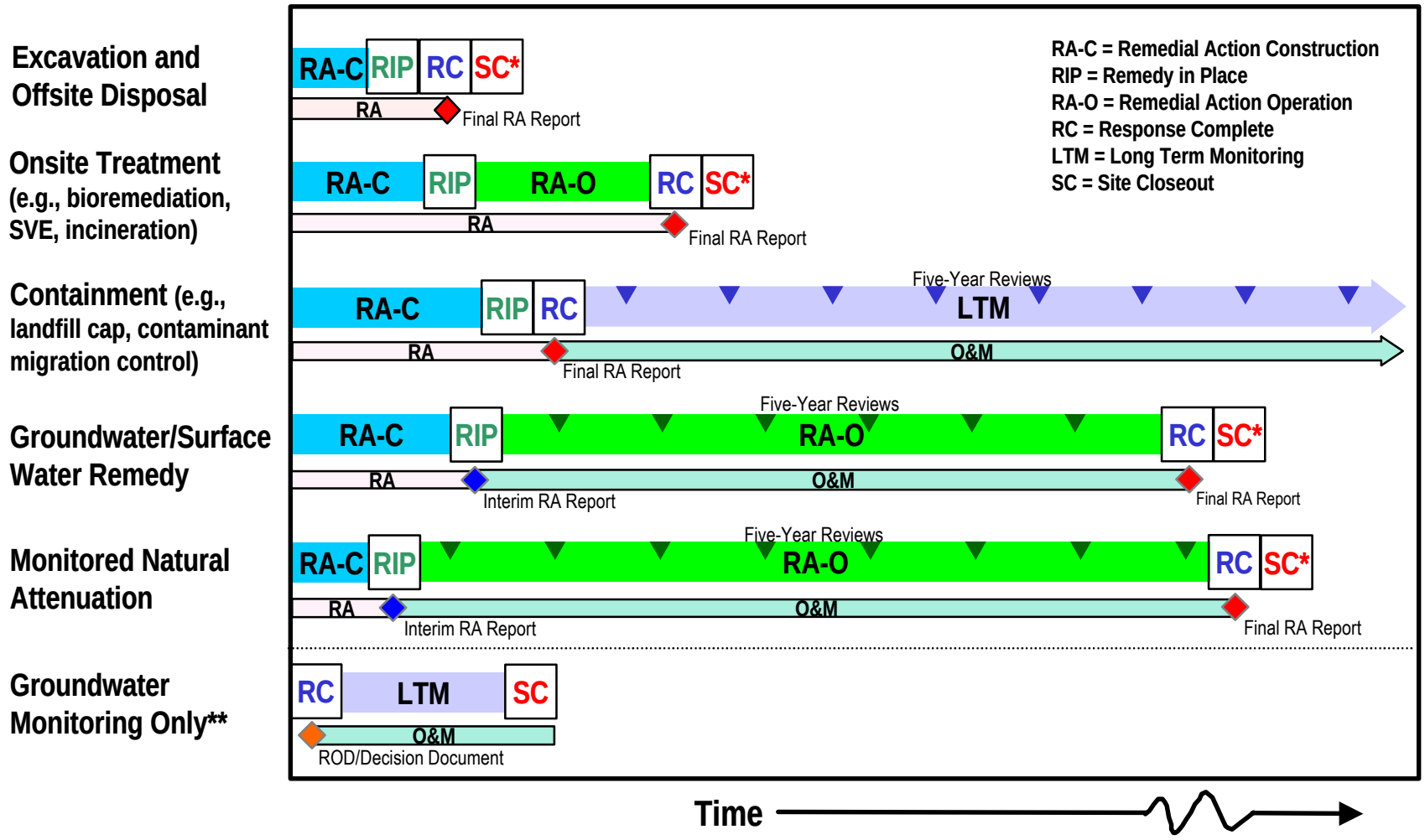
When a selected remedy is a hybrid of several remedy scenarios, it is important to remember that the remedy does not achieve a particular milestone until all components of the remedy have attained that milestone. In the example above, the remedy would not achieve "response complete" until the groundwater pump-and-treat reached its cleanup goals, likely a much later date than that on which the soil source excavation achieved its "response complete."

Figure 2.0 and Table 2.0 also compare the DoD environmental restoration program terminology with that used in EPA's Superfund program. In the Superfund program, the primary post-remedy decision phases are Remedial Action (RA) and Operation and Maintenance (O&M). O&M activities are only applicable to containment remedies, groundwater and surface water restoration, and monitored natural attenuation. O&M are the activities required to maintain the effectiveness or the integrity of the remedy, and, in the case of measures to restore groundwater or surface water and natural attenuation, continued operation of such measures until remediation levels are achieved. Except for long-term groundwater or surface water remedies (pump and treat, natural attenuation), O&M measures are initiated after the remedy has achieved the remedial action objectives and remediation goals in the ROD. Achievement of cleanup goals is marked by completion of a Final RA Report; for long-term groundwater and surface water remedies, an Interim RA Report can be prepared once the remedy is in place.

In many cases there is not a straightforward relationship between the EPA Superfund and DoD terms. However, much of EPA's current guidance is not phrased in terminology applicable to a Federal facility (i.e., it is directed toward Fund-lead and PRP sites). Therefore, it is important to exercise care in the application and usage of EPA's terminology in the context of a DoD facility's environmental restoration program. The comparison of the DoD terminology and the EPA Superfund terminology is also discussed in Section 3.

FIGURE 2.0 APPLICABLE PHASES/MILESTONES AND TIMEFRAMES FOR TYPICAL REMEDY SCENARIOS*

WITH COMPARISON TO EPA/SUPERFUND TERMINOLOGY (SHOWN SECOND FOR EACH SCENARIO)



*A final remedy may be a hybrid of some or all of these remedy scenarios.
SC* = Indefinite LTM may be required for some sites (see Table 2.0).
** May be the only remedy selected at a site. Also applicable where previous Removal Actions and/or IRAs have achieved cleanup objectives, and the final remedy decision finds that only monitoring is needed to ensure permanence of the remedy.

Table 2.0 Descriptions of Remedy Scenarios

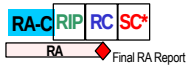
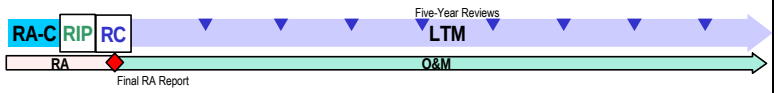
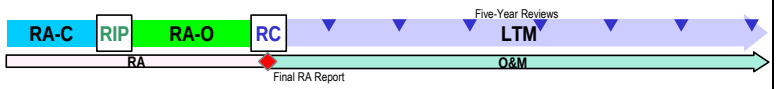
REMEDY SCENARIO	DESCRIPTION
Excavation and Offsite Disposal **Unlimited Use/Unrestricted Exposure:**  **Limited Use/Restricted Exposure:**  	The excavation and offsite disposal remedy would be constructed **(RA-C),** as necessary, in accordance with plans and specifications developed during the **RD** phase. **RA-C** would also consist of excavating and transporting contaminated materials to an offsite disposal location. Following completion of **RA-C** and conduct of appropriate inspections, **RIP** would be achieved. If the site is cleaned up to unlimited use and unrestricted exposure levels, **RC,** and **SC** would be achieved. If hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (e.g., the site is cleaned up to industrial use levels), indefinite **LTM** would be required, involving at a minimum, review of the protectiveness of the remedial action no less often than every five years to ensure that human health and the environment are being protected (i.e., five-year reviews). ***Corresponding EPA Superfund Milestones/Phases:*** DoD — EPA RA-C/RIP/RC — RA concluding with approval of Final RA Report LTM (if required) — O&M
Onsite Treatment **(e.g., bioremediation, soil vapor extraction, and incineration)** **Unlimited Use/Unrestricted Exposure:**  **Limited Use/Restricted Exposure (including Technical Impracticability):**  	The onsite treatment system would be constructed **(RA-C)** in accordance with plans and specifications developed during the **RD** phase. Following completion of the remedy construction and conduct of appropriate inspections, **RIP** would be achieved. The treatment system would be operated (**RA-O**) until remedial objectives are achieved. If the site is cleaned up to unlimited use and unrestricted exposure levels, **RC** and **SC** would be achieved. If hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure, indefinite **LTM** would be required, involving at a minimum, review of the protectiveness of the remedial action no less often than every five years to ensure that human health and the environment are being protected (i.e., five-year reviews). If it is determined during the **RA-O** phase that remedial action objectives cannot be achieved and a Technical Impracticability (TI) waiver is granted to achieve **RC,** indefinite **LTM** would be required, involving at a minimum, review of the protectiveness of the remedial action no less often than every five years to ensure that human health and the environment are being protected (i.e., five-year reviews). Groundwater Monitoring may also potentially be required. ***Corresponding EPA Superfund Milestones/Phases:*** DoD — EPA RA-C/RIP/RA-O/RC — RA concluding with approval of Final RA Report LTM (if required) — O&M

Table 2.0 Descriptions of Remedy Scenarios

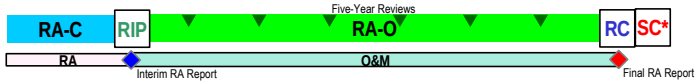
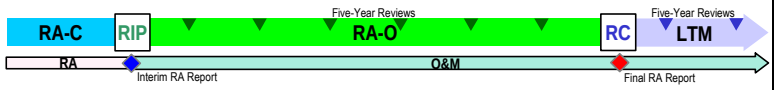
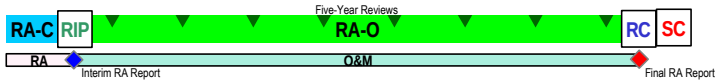
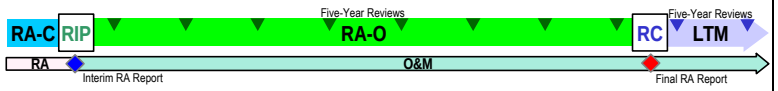
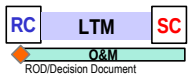
REMEDY SCENARIO	DESCRIPTION
Containment **(e.g., landfill cap, leachate collection/treatment systems, and groundwater/ surface water interception/ diversion measures)** 	The containment remedy would be constructed **(RA-C)** in accordance with plans and specifications developed during the **RD** phase. Following completion of the remedy construction and conduct of appropriate inspections, **RIP** would be achieved. **RC** would also be achieved because remedial action objectives would be met with completion of construction. No **RA-O** would be required with this remedy; operation of leachate collection/treatment systems and water interception/diversion measures would be considered part of **LTM**. Indefinite **LTM** may be required to operate and/or maintain the effectiveness and integrity of the constructed remedy (e.g., maintenance of a landfill cap), including conduct of five-year reviews to ensure continued protectiveness of the remedial action. ***Corresponding EPA Superfund Milestones/Phases:*** DoD — EPA RA-C/RIP/RC — RA concluding with approval of Final RA Report LTM — O&M
Groundwater or Surface Water Remedy **Unlimited Use/Unrestricted Exposure:**  **Limited Use/Restricted Exposure (including Technical Impracticability):** 	The water treatment remedy (e.g., a groundwater pump and treat system) would be constructed **(RA-C)** in accordance with plans and specifications developed during the **RD** phase. Following completion of the remedy construction and conduct of appropriate inspections, **RIP** would be achieved. The treatment system would be operated (**RA-O**) until remedial action objectives specified in the **ROD/DD** are achieved (**RC**). Limited **LTM** activities (e.g., groundwater monitoring) could be required as part of **RC** to demonstrate that concentrations are at or below cleanup standards prior to achieving **SC**. Five-year reviews would be required during the **RA-O** phase, beginning five years from the date that **RA-C** is initiated. If achieved cleanup objectives do not allow for unlimited use and unrestricted exposure (i.e., the site is cleaned up to industrial use levels), indefinite **LTM** would be required, involving at a minimum, review of the protectiveness of the remedial action no less often than every five years to ensure that human health and the environment are being protected (i.e., five-year reviews). If it is determined during the **RA-O** phase that remedial action objectives cannot be achieved and a Technical Impracticability (TI) waiver is granted to achieve **RC,** indefinite **LTM** would be required, involving at a minimum, review of the protectiveness of the remedial action no less often than every five years to ensure that human health and the environment are being protected (i.e., five-year reviews). ***Corresponding EPA Superfund Milestones/Phases:*** DoD — EPA RA-C/RIP — RA concluding with approval of Interim RA Report RA-O/RC/LTM — O&M with approval of Final RA Report at RC

Table 2.0 Descriptions of Remedy Scenarios

REMEDY SCENARIO	DESCRIPTION
Monitored Natural Attenuation **Unlimited Use/Unrestricted Exposure:**  **Limited Use/Restricted Exposure (including Technical Impracticability):**  	**RA-C** would consist of construction of a monitoring system in accordance with plans and specifications developed during the **RD** phase. **RA-C** would likely only involve the installation of additional monitoring wells; for some sites, no **RA-C** activities may be required. Following completion of the remedy construction and conduct of appropriate inspections, **RIP** would be achieved. The treatment remedy would be operated (**RA-O**) (i.e., performance monitoring) until remedial action objectives specified in the **ROD/DD** are achieved (**RC**). Limited **LTM** (e.g., groundwater monitoring) could be required as part of **RC** to demonstrate that concentrations are at or below cleanup standards prior to achieving **SC**. Five-year reviews would be required during the **RA-O** phase, beginning five years from the date that **RA-C** is initiated. If achieved cleanup objectives do not allow for unlimited use and unrestricted exposure (i.e., the site is cleaned up to industrial use levels), indefinite **LTM** would be required, involving, at a minimum, review of the protectiveness of the remedial action no less often than every five years to ensure that human health and the environment are being protected (i.e., five-year reviews). If it is determined during the **RA-O** phase that remedial action objectives cannot be achieved and a Technical Impracticability (TI) waiver is granted to achieve **RC,** indefinite **LTM** activities would be required, involving at a minimum, groundwater monitoring and review of the protectiveness of the remedial action no less often than every five years to ensure that human health and the environment are being protected (i.e., five-year reviews). ***Corresponding EPA Superfund Milestones/Phases:*** DoD — EPA RA-C/RIP — RA concluding with approval of Interim RA Report RA-O/RC/LTM — O&M with approval of Final RA Report at RC
Groundwater Monitoring Only**  ** Typically applicable where previous Removal Actions and/or IRAs have achieved cleanup objectives, and the final remedy decision finds that only monitoring is needed to ensure permanence of the remedy.	If a No Action **ROD/DD** (e.g., for a site with a previous removal action) specifies that groundwater monitoring (**LTM**) is the only activity that would be undertaken, **RC** would be achieved when the **ROD/DD** is signed. The limited **LTM** activities would be performed to ensure that assumptions regarding no action are correct. When the limited **LTM** activities are terminated, **SC** would be achieved. ***Corresponding EPA Superfund Milestones/Phases:*** DoD — EPA RC/LTM — O&M